SECTION THREE – FACT SHEETS

Chapter Sixteen – Land Formations

Geographic Features
Geology

Fact Sheet – Geographic Features

Variety is the key word when referring to the natural features of Acadia National Park. While many parks have been established to highlight and protect a very specific natural feature, visitors to Acadia experience a wide diversity of ecosystems and biological communities. With elevation in the park ranging from 1,530 feet to sea level, animals and plants inhabit zones from sub-alpine to intertidal. Ocean, mountains, lakes, streams, wetlands, forests, meadows, and beaches are all found within the roughly 48,000 acres of Acadia, and each feature makes a unique contribution to the natural tapestry.

SHORELINES AND COAST

The resilient land of Acadia National Park continued to rise relative to the sea until about 10,000 years ago, when it finally stabilized. Since that time, the level of the sea worldwide has risen to its present height, and continues to rise at a rate of about two inches per century. The rising sea and depressed land mass created a "drowned coast."

This means that what appears today as arms and fingers of the sea were once river valleys; islands were the tops of mountains; headlands and peninsulas were rocky ridges. The bedrock gave substance and the glaciers gave character, but without the sea, Acadia would be like a gem without a setting. Each headland, bay, and inlet reveals the majestic interface between sea and land. Acadia's rocky headlands bear the brunt of enormous energies unleashed in waves that batter cliffs and erupt in lofty spray.

INTERTIDAL ZONE

With over forty miles of rocky shoreline, Acadia National Park possesses a tremendously rich intertidal flora and fauna. Twice daily, the nutrient-rich marine waters cover these plants and animals. However, during the lower stages of the 8- to 12-foot tidal range, the ocean leaves behind pools of water inhabited by sea stars, dog whelks, blue mussels, sea cucumbers, rockweed, and other creatures and plants.

The coastal ocean waters surrounding Acadia are home to countless other animals, from clams and sea urchins to the commercially-prized lobster. Gulls and other seabirds wheel overhead, and marine mammals such as seals, whales, and porpoises often frequent the area. In the Gulf of Maine, species ranging from tiny phytoplankton to large fish make up the diverse yet precarious food web.

BEACHES

The sea constantly reinvents the coastline of Acadia National Park. Waves and currents take material from one point on the coast, only to deposit it somewhere else. Cobble beaches are created in this manner, as rocks are dislodged and smoothed by the force of the ocean then placed on another section of shoreline.

Because Acadia's coast is young, sandy shores are rare. However at Sand Beach, the park's largest feature of this type, shore currents have shifted the tons of sand that the sea eroded from the rocks. Mixed into the sand are broken bits of shells and the skeletons of crabs, mussels, sea urchins, and other marine life.

MOUNTAINS

At some times of the year the sun touches the slopes of Cadillac Mountain before any other place in the United States. At 1,530 feet, Cadillac is the highest point along the North Atlantic seaboard of the United States. It is one of 17 mountains that rise from the sea and comprise much of the island on which a portion of Acadia National Park is located.

The mountains were built up by tectonic and volcanic forces, and scraped down and shaped by a succession of glaciers. The land sank beneath the weight of mile-deep ice as glaciers inexorably ground their way toward present day Georges Bank, Long Island, and Cape Cod. As the glaciers receded, they filled a vast valley surrounding the mountains with meltwater, creating the Gulf of Maine. Relieved of the great burden of the ice, the land slowly rebounded. These processes, over the eons of time, created the landscape of which Acadia National Park and its mountains are a part.

Life is not easy at the top, but the mountains are not as barren as Champlain described. They are home to forests of spruce and pitch pine. Tiny subalpine plants, such as cinquefoil, blossom in joints in the granite and on the leeward side of rocks. Squat, gnarled trees may survive winter after harsh winter. And, during the spring and summer, peregrine falcons have called some sheer mountain cliffs home.

WETLANDS

Over 20% of Acadia National Park is classified as wetland. All classes of wetlands (marine aquatic beds, intertidal shellfish flat, salt marshes, freshwater marshes, forested wetlands, and peatlands) are found within the park. They form the transition between terrestrial and aquatic environments, and contribute significantly to the health, productivity, and uniqueness of the region.

Wetlands are especially important because they maintain biodiversity by providing a habitat for a wide range of species. Native wildlife frequent wetlands alongside species that are nesting, overwintering, or migrating, such as birds along the Atlantic flyway. More than half of Maine's state-listed rare plants are found in wetland habitats, and at least one rare plant is found in each Acadia wetland type.

The freshwater wetlands of Acadia National Park and Mount Desert Island are living communities that are still in the process of formation. In a hundred years, many of them will look different than they do today. The Tarn and Aunt Betty's Pond, for instance, are filling in and emergent wetland plants such as arrowhead, bayonet grass, and pickerelweed make the two ponds look like green meadows in late summer.

Forested wetlands are one type of freshwater wetland. In Acadia, the dominant species include northern white cedar, red spruce, and black spruce, together with subordinate species such as larch, red maple, quaking aspen, and white birch. Shrubs include serviceberry, winterberry, speckled alder, green alder, highbush blueberry, wild raisin, meadowsweet, mountain holly, sheep laurel, blueberry, sweetgale, black huckleberry, Labrador tea, and leatherleaf. Ground cover species include skunk cabbage, bunchberry, Canada mayflower, starflower, twinflower, goldthread, swamp dewberry, creeping snowberry, large-leaved cranberry, three-seeded sedge, cinnamon fern, and sphagnum moss.

LAKES, PONDS, AND STREAMS

A canoe paddle ripples through the water while a loon's call is heard in the distance; screams of summer excitement at Echo Lake; a seasonal waterfall rushing over a granite cliff after a summer storm. All these scenes possess a similar theme—water. Whether along a quiet stream or an inland lake or pond, water is a central feature to an Acadia National Park experience.

Twenty-six lakes and ponds dot the Acadia landscape ranging in size from a few acres to almost 900 acres. Some are located entirely within Acadia National Park's boundaries while others are shared with private landowners and local communities. Numerous streams, both seasonal and permanent, run through the park, feeding many of the lakes, ponds, and marshes.

See also mountains and lakes information in appendix D.

Fact Sheet – Geology

The landscape that we know as Acadia had its beginnings more than 500 million years ago, when mud, sand, and volcanic ash were deposited in an early ocean. With time, forces deep within the earth buried, heated, and squeezed sediments into Ellsworth Schist, a metamorphic rock characterized by contorted, thin bands of white and gray quartz and feldspar, and green chlorite. It is the oldest rock known in the Mount Desert region.

The combined forces of erosion and the shifting of the rigid plates that make up the earth's crust (tectonics), brought the deeply buried Ellsworth Schist to the earth's surface. Approximately 450 million years ago, it formed the floor of an ocean which accumulated sand and mud. Burial hardened these fine-grained deposits creating the Bar Harbor Formation, a sequence of brown to gray bedded, or layered, sandstone and shale. Following, or simultaneously with, the creation of the Bar Harbor Formation, volcanoes erupted in the region. Volcanic flows and ash accumulated in the ocean basin, and formed the light-colored Cranberry Island volcanics.

A complex series of events followed, leading to the intrusion of several different types of molten, or igneous, rocks. The intrusive rocks cooled deep within the earth, allowing the crystals of various minerals to form and grow. Each rock type is composed of a unique set of minerals. The first and oldest is a gabbro. This rock is dark in color, and is made up of iron-rich minerals.

The granites of Mount Desert Island are approximately 420 million years old. Because their mineralogy is so similar, the granites are identified by the size of individual mineral grains and the composition of the scattered dark minerals present. One of the oldest granites to appear was the Cadillac Mountain Granite, the largest granite body on the island. It oozed up through existing rocks, stressing and fracturing the overlying bedrock and causing large chunks to fall into the molten magma body. Some chunks of bedrock melted in the intense heat, while others were suspended in the magma. When the granite cooled deep in the earth, these blocks remained, surrounded by crystallized granite. This region of granite and broken rock, called the shatter zone, is still visible on the eastern side of the Cadillac Mountain Granite.

A medium-grained granite formed to the west of the Cadillac Mountain Granite. Later volcanic activity injected basalt, a fine-grained, black, igneous rock into the granites and surrounding rocks. These basalt bodies, or dikes, can be seen along the Cadillac Mountain summit road and on Schoodic Peninsula.

Little record of the following several hundred million years remains. Erosion wore away the rocks covering the large granite bodies, bringing them to the earth's surface. The same process removed much of the softer rock surrounding the granite, leaving behind resistant granitic mountains ringed by lowlands. Streams ran between the ridges, and a succession of plant and animal life inhabited the region.

ODYSSEY OF ICE

Evidence from many parts of the world suggests that a succession of ice sheets flowed across northern North America during the last two to three million years. Each glaciation removed traces of previous ice sheets, leaving a record of only the last ice sheet to move through the region.

The glaciers eroded the mountains and cut broad U-shaped valleys. Materials carried at the base of the ice polished the mountains, and left long scratches (striations) and crescent-shaped gouges (chatter marks) in many places. This episode, called the Wisconsin Glaciation, reached its maximum extent 18,000 years ago with its terminus far to the south of Maine. As the climate warmed, more ice melted in the warmer months than accumulated in the winter. Although ice continually flowed south from more northern portions of the ice sheet, the front of the glacier began to recede, exposing deposits of material carried by glaciers. Accumulations of rock, gravel, and sand dammed valleys. Boulders carried 20 miles or more were left behind by the melting ice. These glacial erratics are found in valleys and on mountain tops. A carpet of glacial debris was spread out upon the landscape. The vast weight of the ice depressed the land surface, so that in Maine's coastal region the melting of ice was accompanied by an invasion of the sea. Marine waters covered the lowlands and created islands of Acadia's mountains. Beaches and sea caves formed at almost 300 feet above the present day sea level. Fine-grained material settled out of the sea, and draped low areas with a layer of marine mud. With the continued recession of the ice, the land surface rose and stabilized. Lakes, such as Jordan Pond, formed in valleys dammed by ridges of glacial debris. Plants and animals colonized the uncovered land. Rivers and streams carved new drainage paths, and by 5,000 years ago, the region became the home of people.

TODAY

The varied landscape of Acadia is the result of continuing geologic processes. A striking geologic activity is the weathering of granite ridges. Large joints, or fractures, in the rock form square blocks. The joints enlarge and expand when water fills them and freezes. Eventually the rock breaks away from the cliff leaving behind granitic rubble and bright pink scars on precipitous rock faces.

Along the coast, the sweep of tides and waves continually shape the shoreline. Rocky headlands bear the full brunt of the wind and waves of the open ocean. Salt marshes, rich with life, grow in protected tidal valleys, while beaches occupy sheltered coves.

Many different types of beaches are found on Acadia's shores. The size of material composing the beach depends on the energy of the waves which create it. Coves protected from strong wave action are made up of fine-grained material, such as Sand Beach. Beaches facing the open ocean and only minimally sheltered by rocky headlands consist of pebbles, cobbles, and even boulders. The stronger the wave action, the larger the material the waves can carry. In the case of a beach open to the storm driven waves of the Atlantic, only the largest boulders remain.

The source of the beach material varies. In some places, glacial debris is washed in by the waves, and finer material is removed leaving cobbles and pebbles to be rolled and rounded by the surf. Sea cliffs can provide beach material, such as large rounded boulders. Sand Beach is composed primarily of bits and pieces of the shells and hard parts of marine life, such as mussels and sea urchins.

Acadia's landscape is the product of great expanses of time. Massive geologic forces —mountain building, molten magmas, and huge ice sheets—formed the landscape, while the persistent forces of erosion—water, wind, and waves—ever so slowly continue to shape what we see today, leaving a record of Acadia's geologic past written in the rocks.

See also related geology information in appendix D.